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Effect of automotive side member materials on the Head Injury Criteria (HIC) and Chest Severity Index (CSI) of adult passenger

ABSTRACT

This paper presents the results for Head Injury Criteria (HIC) and Chest Severity Index (CSI) of an adult occupant in frontal impact. The component being studied is side member as impact energy absorber. Steel side member is used as the benchmark material, whereas aluminum alloy is used as lightweight material. Crash analyses are conducted using nonlinear finite element analysis software Ls-dyna. The effect of different types of aluminum alloy and component thickness on the HIC, CSI, weight and energy absorbed is assessed and discussed. A cost function is then formulated with the geometrical average method to solve the multi-objective problem. The HIC36 and CSI are set as minimum requirements in the optimization. The material used was Aluminium alloy of AA 5182 AA5751. It was found that AA5751 with inner and outer thickness of 2.8 mm and 4.9 mm respectively, provides a reduction in mass of 1.03 kg compared with steel and has energy absorbed of 11.9 kJ. The lowest values of HIC36 and CSI obtained are 1146 and 665.4 respectively.

Keyword: Automotive side member; Chest Severity Index (CSI); Crash analysis; Head Injury Criterion (HIC)